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(54) **RECORDING APPARATUS**

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B41J 29/02 (2006.01)
B41J 3/28 (2006.01)

(52) **U.S. Cl.**
CPC . ***B41J 29/023*** (2013.01); ***B41J 3/28*** (2013.01)

(58) **Field of Classification Search**
CPC B41J 23/00
USPC 347/104
See application file for complete search history.

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(57) **ABSTRACT**

A recording apparatus includes a supporting stage that supports a recording medium; a recording processing unit, which includes a recording unit that opposes the recording medium that is supported by the supporting stage, and bridges an X axis direction so as to cross the supporting stage; and a Y axis movement unit causes the recording processing unit to move in relation to the supporting stage in a Y axis direction that is perpendicular to the X axis direction and is parallel to a supporting surface of the supporting stage, in which the Y axis movement unit includes a drive mechanism, which causes the recording processing unit to move in the Y axis direction in relation to the supporting stage, and a linear guide mechanism, which is disposed on a rear surface side of the supporting stage, and supports the recording processing unit to be free sliding in the Y axis direction in relation to the supporting stage.

8 Claims, 7 Drawing Sheets

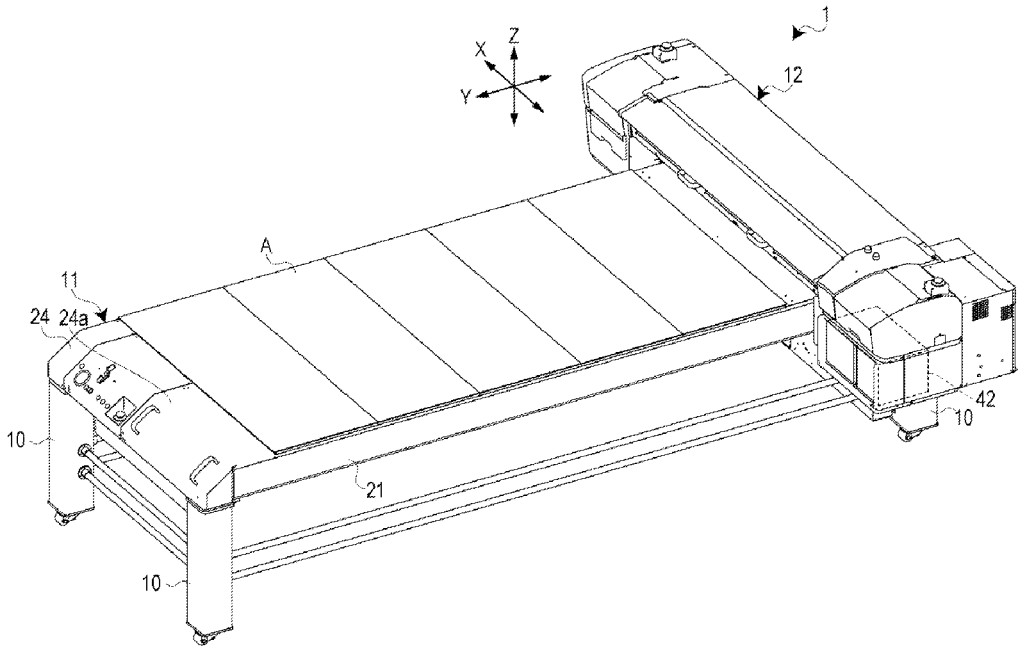

FIG. 1

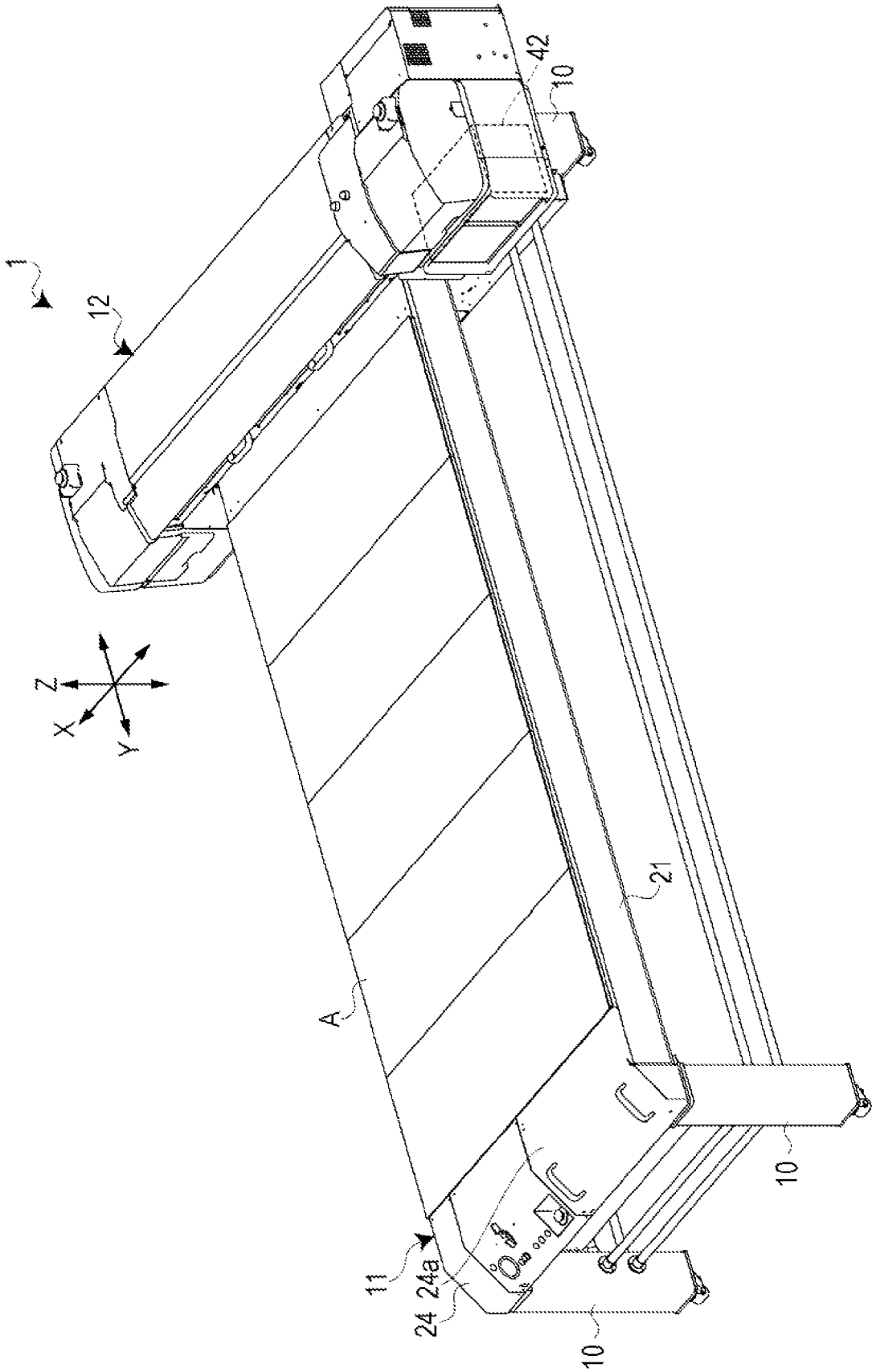

FIG. 2A

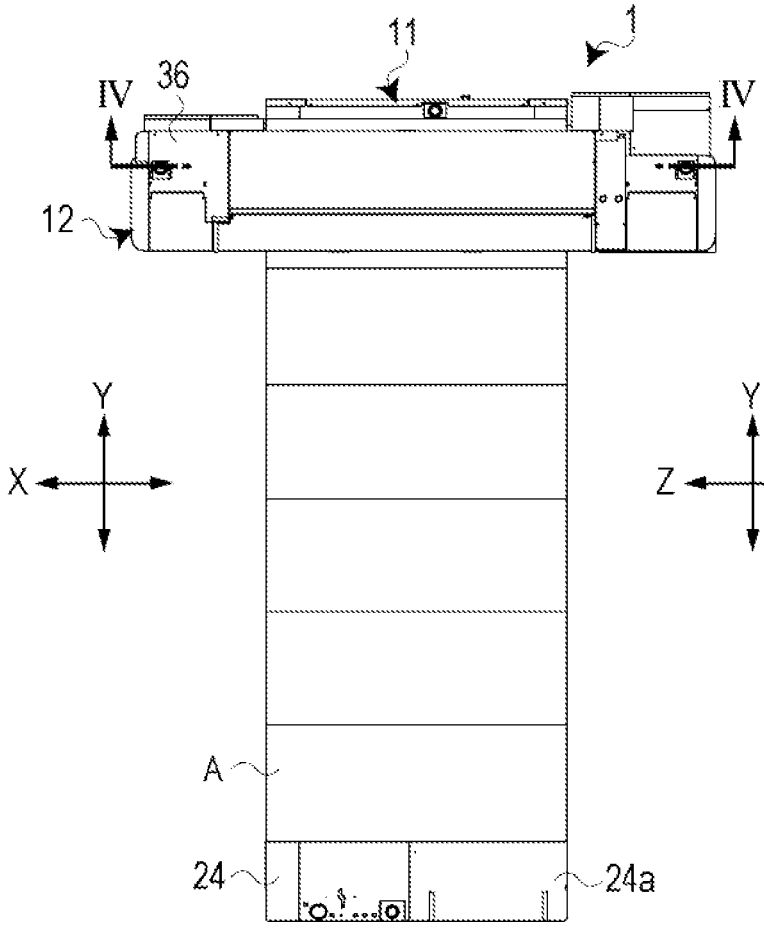

FIG. 2C

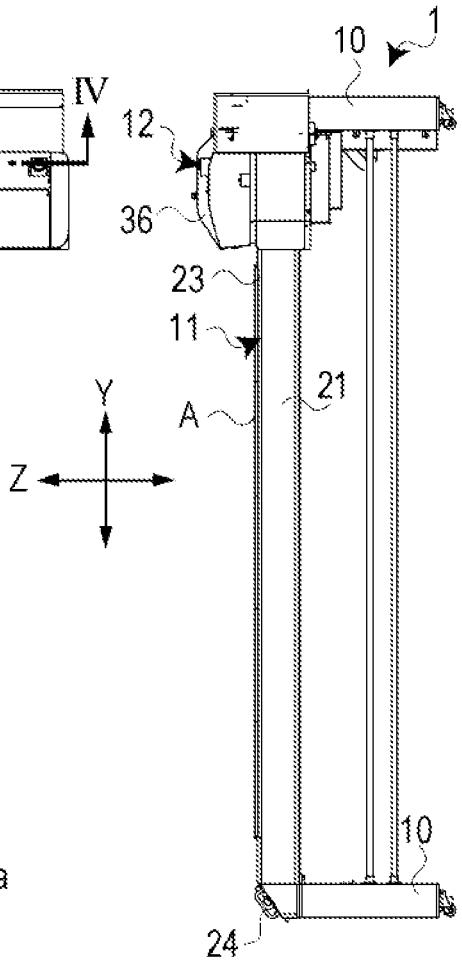

FIG. 2B

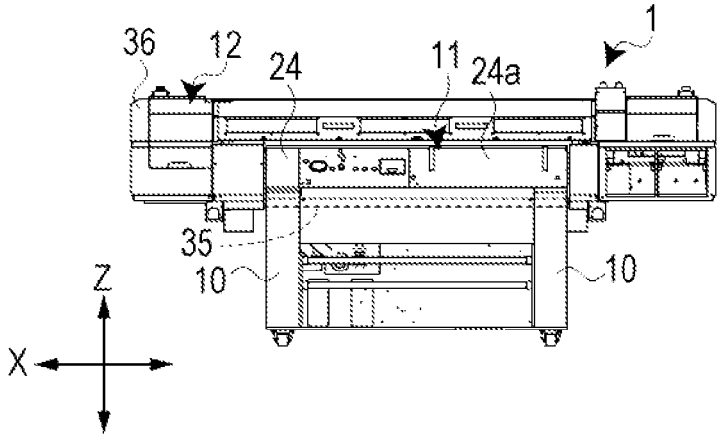

FIG. 3

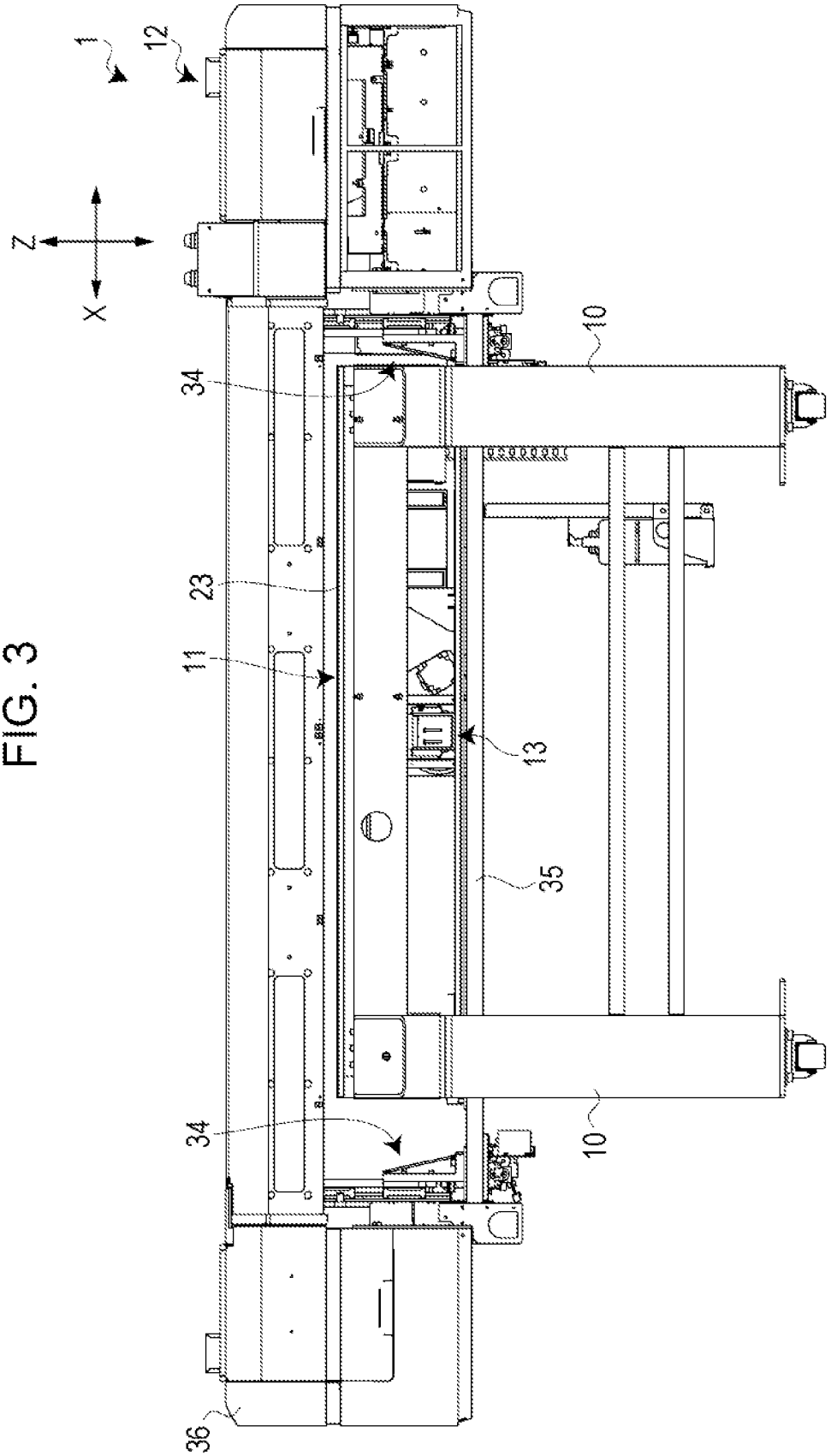

FIG. 4

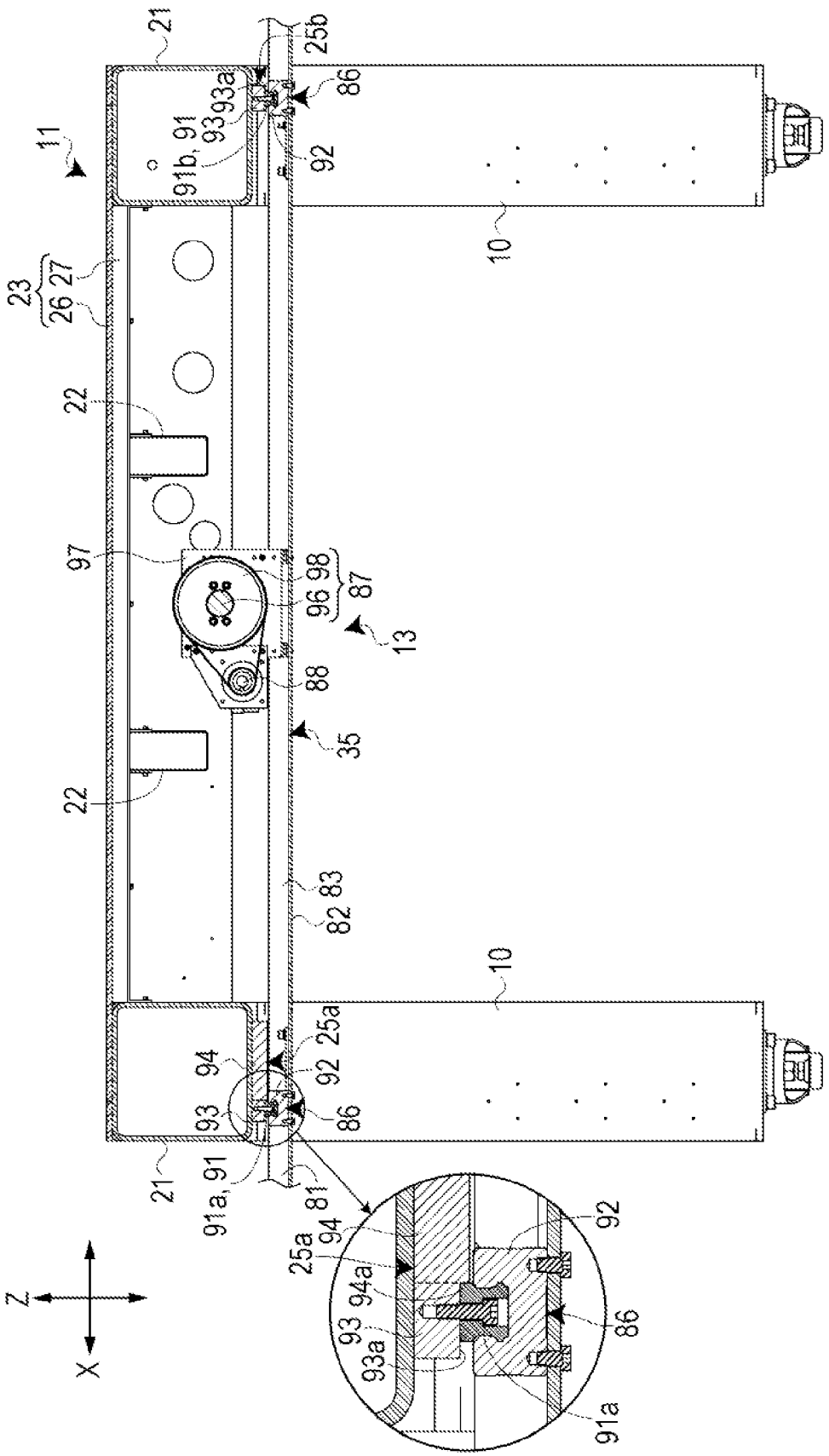
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FIG. 5

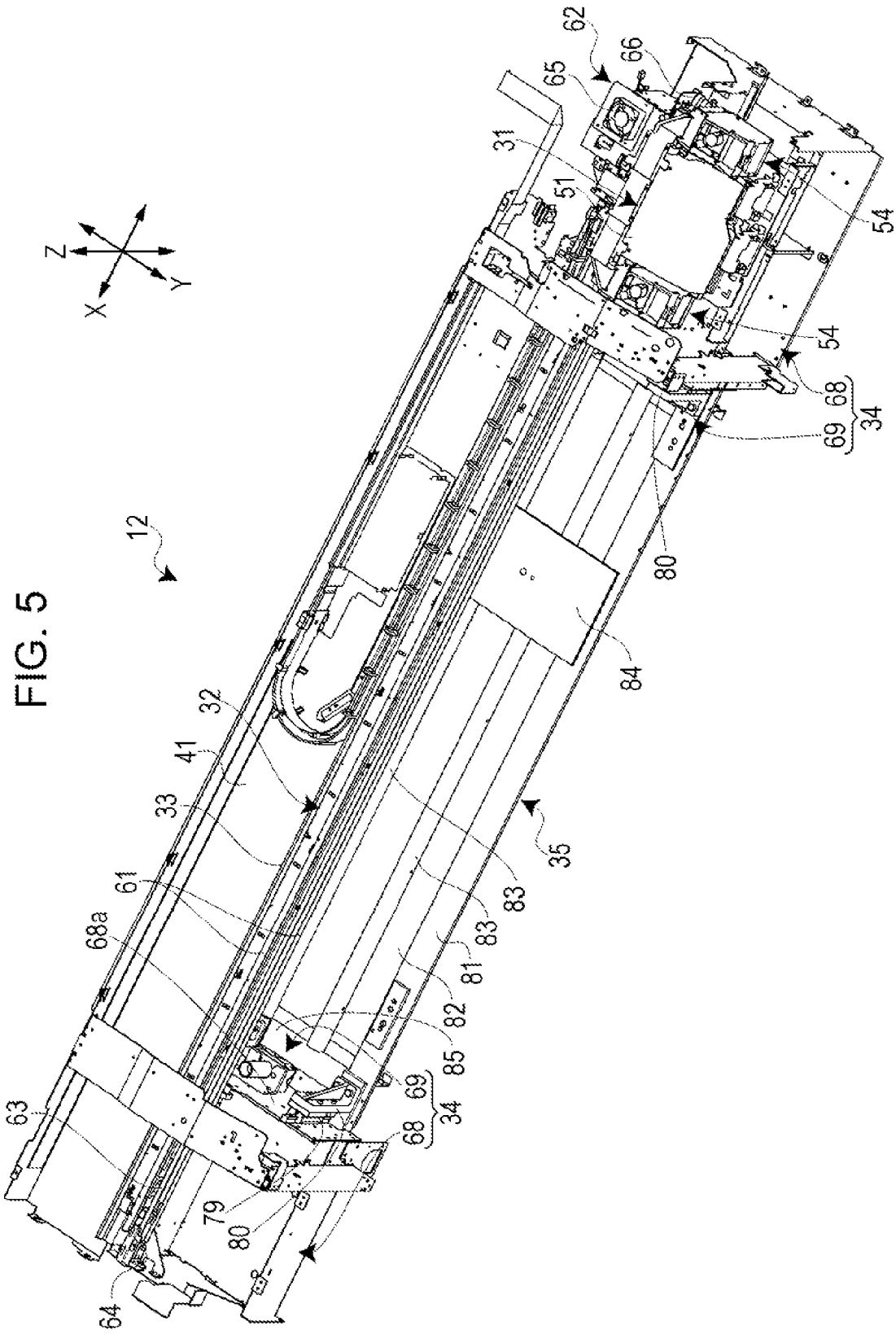
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FIG. 6

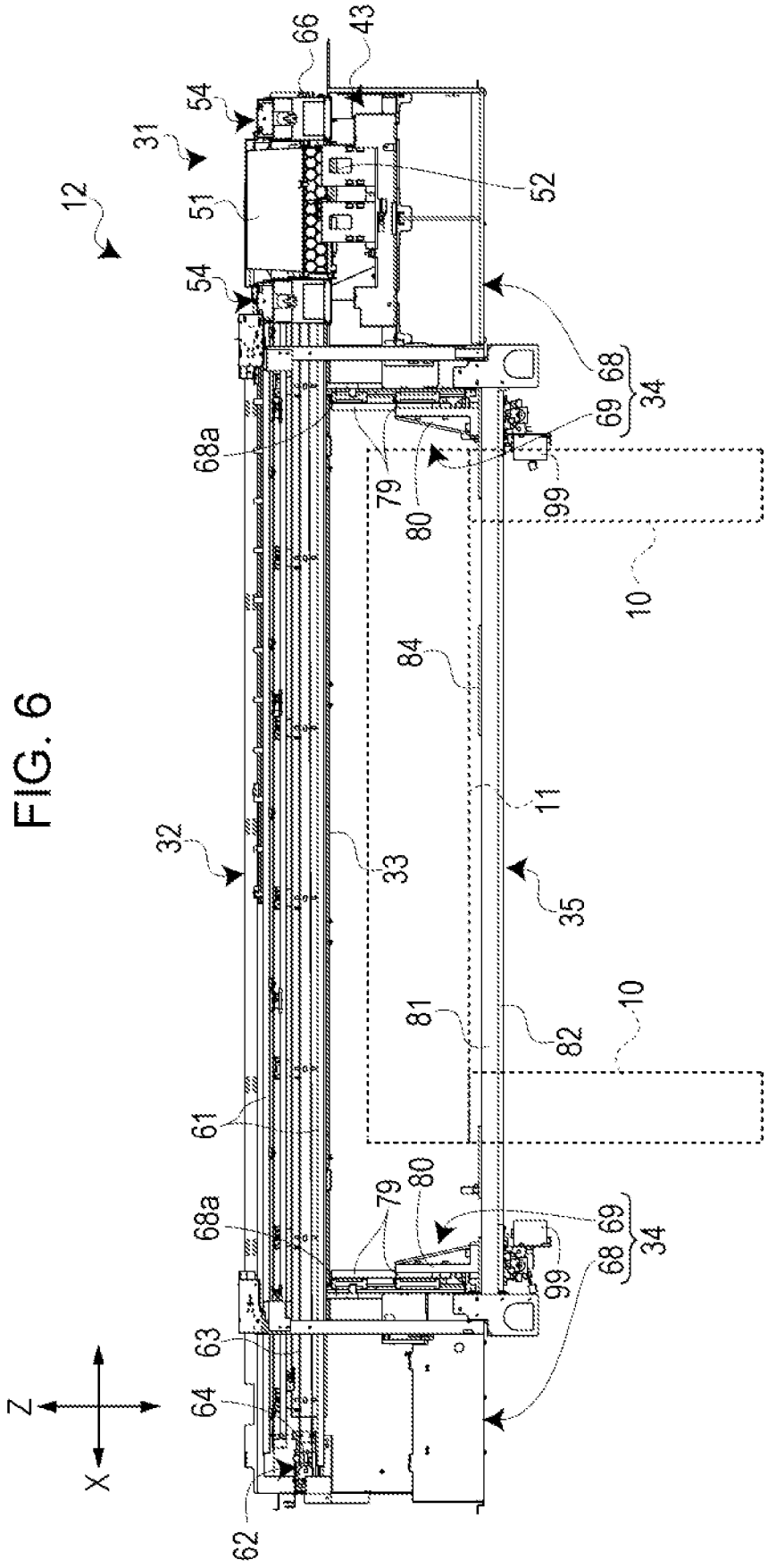
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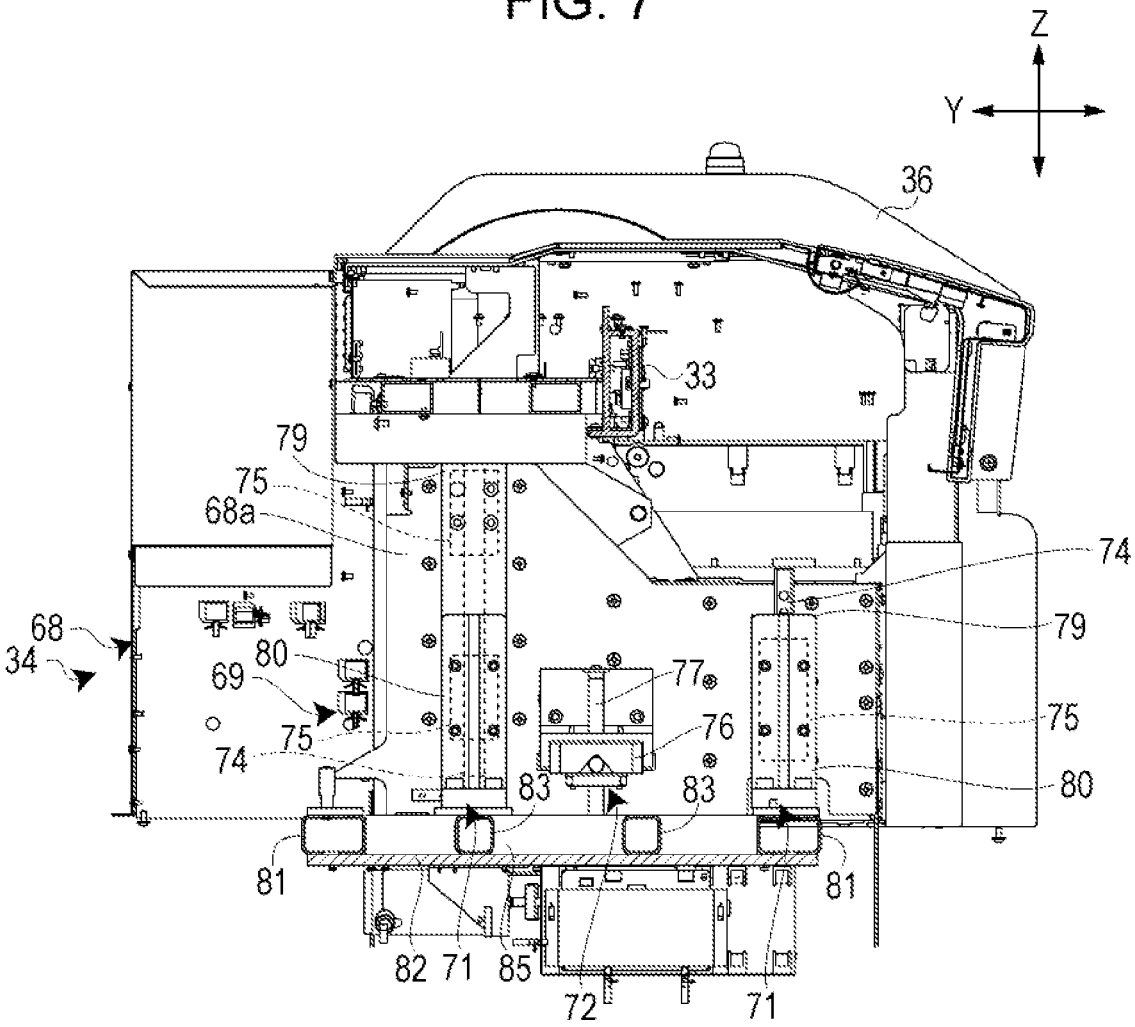
FIG. 7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RECORDING APPARATUS

BACKGROUND

1. Technical Field

The present invention relates to a so-called flatbed type recording apparatus, in which a recording unit moves, and performs recording on a recording medium that is positioned on a stage.

2. Related Art

In the related art, a known example of this type of recording apparatus includes a base member, and a flatbed which is disposed on the base member and supports a recording paper (refer to JP-A-2002-2054). This known example further includes an ink head that is disposed to face the flatbed, a carriage on which the ink head is mounted, and a supporting member which supports the carriage to be freely movable in a horizontal direction (i.e., a Y axis direction). The known example further includes a pair of left and right rails which extend in a horizontal X axis direction (perpendicular to the horizontal Y axis direction in the perpendicular plane) on a base member. The known example also includes a pair of left and right movable blocks which are fixed to the supporting member and are capable of moving on the rails. In other words, in this recording apparatus, a linear guide mechanism (such as a pair of rails and a pair of movable blocks) is disposed on the upper surface side of the base member in a manner in which the linear guide mechanism supports the carriage to be freely movable in the X axis direction via the supporting member.

However, in this configuration, since the linear guide mechanism is disposed on the upper surface side of the base member (i.e., on the surface side of the flatbed), the positions of the supporting member and the carriage become higher by an amount of the dimensions of the linear guide mechanism. As a result, there is a problem in that the height dimension (i.e., the dimension in which the ink head and the flatbed face one another) of the entire recording apparatus becomes larger. Furthermore, since the linear guide mechanism is disposed to avoid the placement region in which the recording paper is placed, there is a problem in that a planar dimension (a horizontal dimension perpendicular to the height direction) of the entire recording apparatus become larger by the amount of the dimensions of the linear guide mechanism.

It is also conceivable to dispose the linear guide mechanism on the surfaces on the left and right lateral sides of the base member; however, even in this case, the planar dimensions of the entire recording apparatus become larger by the amount of the dimensions of the linear guide mechanism.

SUMMARY

An advantage of some aspects of the invention is that a recording apparatus is provided, in which it is possible to reduce the dimensions of the entire recording apparatus.

According to an aspect of the invention, there is provided a recording apparatus that includes a stage, which includes a supporting surface that supports a recording medium; a recording processing unit, which includes a recording unit that performs recording on the recording medium that is supported by the stage, and bridges a first direction so as to cross the stage; and a movement unit, which causes the recording processing unit to move in relation to the stage in a second direction that is perpendicular to the first direction and is parallel to the supporting surface, in which the movement unit includes a drive mechanism, which causes the recording processing unit to move in the second direction in relation to the stage, and a linear guide mechanism, which is disposed on a rear surface side of the stage, and supports the recording processing unit to be free sliding in the second direction in relation to the stage.

In this configuration, by disposing the linear guide mechanism on the rear surface side of the stage, the position of the recording processing unit is not heightened by the amount of the dimensions of the linear guide mechanism. In other words, it is possible to reduce the height dimension of the entire recording apparatus (the dimension of the direction in which the recording unit and the stage oppose one another). By causing the stage and the linear guide mechanism to overlap one another by disposing the linear guide mechanism on the rear surface side of the stage, it is possible to reduce the planar dimensions (the dimensions of the directions that are perpendicular to the opposing direction described above) of the entire recording apparatus in comparison with a configuration in which "the linear guide mechanism is disposed on the lateral side of the stage". Furthermore, the linear guide mechanism does not interfere with the recording performed by the recording unit due to the linear guide mechanism being disposed on the rear surface side of the stage. Accordingly, it is possible to dispose the linear guide mechanism to overlap with the recording unit and the recording medium; thus, it is possible to reduce the planar dimensions of the entire recording apparatus even in comparison to a configuration in which "the linear guide mechanism is disposed on the upper surface side of the stage". In addition, when the stage is configured by the table main body and the structural bar to which the table main body is attached, it is possible to guarantee the parallelism of the table attachment surfaces onto which the table main body is attached, and the parallelism of the attachment surfaces (the rail attachment surfaces) onto which the linear guide mechanism (for example, the guide rail) is attached by only milling the upper and lower surfaces thereof in relation to the structural bars. Accordingly, it is possible to manufacture the recording apparatus easily in comparison to a configuration in which "the linear guide mechanism is disposed on the lateral side of the stage", where it is necessary to mill the side surfaces.

In this case, it is preferable that the movement unit include a plurality of the linear guide mechanisms, which are separated from one another in the first direction.

In this configuration, by using a plurality of the linear guide mechanisms that are separated from one another in the first direction, it is possible to stably perform the movement in the second direction regardless of the position of the drive mechanism.

It is preferable that the drive mechanism be disposed between the plurality of linear guide mechanisms in the first direction.

In this configuration, by using a plurality of the linear guide mechanisms that are disposed to interpose the drive mechanism, it is possible to stably perform the movement in the second direction. For example, by including two of the linear guide mechanisms and disposing the drive mechanism in the middle, between the linear guide mechanisms, it is possible to dispose the drive mechanism and the linear guide mechanisms such that the distance therebetween is as short as possible, and good balance is obtained. Therefore, it is possible to suppress the influence of yawing centered on the drive mechanism.

In this case, it is preferable that the drive mechanism be disposed between a portion of the stage that makes contact with the recording medium, and the linear guide mechanism in a third direction, which is perpendicular to the first direction and the second direction.

In this configuration, it is possible to dispose the drive mechanism to be as close as possible to a portion of the stage that makes contact with the recording medium (the supporting surface). Therefore, it is possible to suppress the influence of pitching centered on the drive mechanism. The movement mechanism does not interfere with the recording performed by the recording unit due to the movement mechanism being disposed between the portion of the stage that makes contact with the recording medium and the linear guide mechanism. Accordingly, it is possible to dispose the drive mechanism to overlap the recording unit and the recording medium. For example, it is possible to dispose the drive mechanism on the middle of the stage.

In this case, it is preferable that the recording processing unit include a recording unit, a horizontal bridging frame, which crosses the stage and supports the recording unit, a pair of side frames, which holds the horizontal bridging frame by a first side and a second side in the first direction, and a connecting frame, which connects base portion sides of the pair of side frames to one another, and that the linear guide unit include a guide rail, which is fixed to a rear surface side of the stage, and extends in the second direction, and a slider, which is fixed on the connecting frame, and moves on the guide rail in a free sliding manner.

In this configuration, it is possible to accurately perform the movement of the recording unit relative to the stage due to the fixed side (the guide rail) of the linear guide mechanism being fixed to the stage, and the movable side (the slider) of the linear guide mechanism being fixed to the connecting frame. Accordingly, it is possible to improve the movement accuracy of the recording unit.

In this case, it is preferable that the drive mechanism be mounted on the connecting frame.

When the drive mechanism is mounted on the side frame that has low rigidity in the first direction, there is a concern that the linear movement carried out by the drive mechanism will be shifted in the first direction.

In contrast, in the configuration described above, by mounting the drive mechanism on the connecting frame, the linear movement carried out by the drive mechanism is not shifted in the first direction, and it is possible to more stably perform the movement of the recording unit in the second direction. The configuration described above does not impede the attachability or maintainability of the movement mechanism.

In this case, it is preferable that the drive mechanism be configured by a drive motor, and a lead screw mechanism, which is driven by the drive motor.

In this configuration, by using the lead screw mechanism (for example, the ball screw mechanism) for the drive mechanism, it is possible to reduce the costs of the drive mechanism.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described with reference to the accompanying drawings, wherein like numbers reference like elements.

FIG. **1** is an external perspective view showing a recording apparatus according to an embodiment.

FIGS. **2**A to **2**C are respectively a plan view, a front view and a side view showing the recording apparatus.

FIG. **3** is a front view showing the recording apparatus with a portion of a supporting stage and a portion of an apparatus cover omitted.

FIG. **4** is a cross-sectional view across the line IV-IV showing the supporting stage and the periphery of a Y axis movement unit.

FIG. **5** is a perspective view showing a recording processing unit with the apparatus cover omitted.

FIG. **6** is a front view showing the recording processing unit with the apparatus cover omitted.

FIG. **7** is an inner side view showing a side frame and the periphery of a raising and lowering movement unit that is retrofitted therein.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

Hereinafter, the description of the recording apparatus according to an embodiment of the invention will be given with reference to the accompanying drawings. The recording apparatus records a desired image on a recording medium by discharging an ultraviolet curing ink using an ink jet system. Furthermore, the recording apparatus is a so-called flatbed type recording apparatus that performs recording by causing a recording head to move in relation to the recording medium, which recording medium is supported by a supporting stage. The recording medium could be, for example, recording media of any thickness such as thick paper, wood, tile, plastic board, and cardboard.

As will now be described, the X axis (left and right) direction, the Y axis (front and back) direction and the Z axis (up and down) direction are defined as shown in the drawings. The Y axis direction and the X axis direction are directions that are parallel to the supporting surface (the setting surface) of the supporting stage. The Y axis direction is perpendicular to the X axis direction, and the Z axis direction is perpendicular to the X axis direction and the Y axis direction. The far side in FIG. **1** will be referred to as a "first side in the Y axis direction", and the near side in FIG. **1** will be referred to as a "second side in the Y axis direction".

As shown in FIGS. **1** to **3**, a recording apparatus **1** is supported by four leg members **10**, and is provided with a supporting stage (a stage) **11** that supports a recording medium A, a recording processing unit **12** that includes a recording unit **31** (labeled in FIGS. **5** and **6**) facing the supported recording medium A, and a Y axis movement unit (a movement unit) **13** that supports the recording processing unit **12** and causes the recording processing unit **12** to move in the Y axis direction (a second direction) in relation to the supporting stage **11**. The recording processing unit **12** spans the X axis direction (a first direction) so as to cross over the supporting stage **11** in the first direction. Meanwhile, the Y axis movement unit **13** is disposed on the rear surface side of the supporting stage **11** (the surface of the opposite side from the recording processing unit **12** side) to overlap the supporting stage **11**, and supports the recording processing unit **12** in a freely movable manner on the rear surface side of the supporting stage **11** (described hereinafter in detail).

Next, description will be given of the supporting stage **11** with reference to FIGS. **1**, **2**A to **2**C and **4**. FIG. **4** is a cross-sectional view across the line IV-IV (see FIG. **2**A) of the supporting stage **11** and of the periphery of the Y axis movement unit **13** when viewed from the first side in the Y axis direction. As shown in FIGS. **1**, **2**A to **2**C and **4**, the supporting stage **11** includes a pair of left and right beam-shaped structural bars **21** that extend in the Y axis direction, a plurality of supporting members **22** that are disposed in a grid pattern lengthwise and breadthwise between the pair of structural bars **21**, and a suction table **23** that is supported by the pair of structural bars **21** and the plurality of supporting members **22**. The recording medium A is set in place on the structural bars **21** and the plurality of supporting members **22**

by suction. Each of the end portions of the structural bars **21** are connected to the respective leg members **10** by welding or the like.

An operation panel unit **24** (see FIGS. **1** to **2**C) is disposed on the end portions of the second side of the supporting stage **11** in the Y axis direction. An access door **24***a* is provided over a wide portion of the right half portion of the operation panel unit **24**. When manually performing maintenance on the recording processing unit **12**, the recording processing unit **12** is caused to move to the near side (the second side in the Y axis direction), the access door **24***a* is opened, and the maintenance of the recording processing unit **12** is performed from the access door **24***a*.

The suction table **23** includes a table main body **26** (labeled in FIG. **4**) that includes a supporting surface which supports the recording medium A, and has a large number of suction pores (omitted from the drawings). The suction table **23** also includes a suction chamber **27** provided on the underside of the table main body **26**. The suction chamber **27** is connected to a vacuum suction facility (not shown) by a pipe, a duct, or the like. In other words, by driving the vacuum suction facility, the recording medium A that is placed on the table main body **26** is suctioned, and the recording medium A is thereby held onto the table main body **26**.

The structural bar **21** is configured from a bar, the cross-sectional shape of which is square (e.g., a square pipe), and both end portions in the Y axis direction thereof are connected to the respective leg members **10**. The upper surface (the surface side) of the structural bar **21** is a table attachment surface, to which the table main body **26** is attached. Rail attachment bases **25***a* and **25***b* (labeled in FIG. **4**) for attaching guide rails **91** (described hereinafter) are fixed to the respective lower surfaces (the rear surface side) of the structural bars **21**.

As shown in FIGS. **5** and **6**, the recording processing unit **12** is provided with a recording unit **31**, an X axis movement unit **32**, a horizontal bridging frame **33**, a pair of left and right side frames **34**, a connecting frame **35**, and an apparatus cover (refer to FIG. **2**) **36** that covers the above components. The recording unit **31** faces (i.e., opposes) the supported recording medium A and performs recording on the recording medium A. The X axis movement unit **32** supports the recording unit **31** and causes the recording unit **31** to move in the X axis direction. The horizontal bridging frame **33** supports the X axis movement unit **32**. The side frames **34** support the horizontal bridging frame **33** from both sides in the X axis direction (the first side and the second side in the X axis direction). The connecting frame **35** connects the base portion sides of the pair of side frames **34** to one another. The horizontal bridging frame **33** extends in the X axis direction to cross over the supporting stage **11**. Each of the side frames **34** extend downward to below the supporting stage **11**, and the connecting frame **35** is connected to the lower end portions of both the side frames **34** further below the supporting stage **11** than the table main body **26**.

The supporting stage **11** is bridged by the horizontal bridging frame **33**, the pair of side frames **34** and the connecting frame **35**; thus configuring a square-shaped (a rectangular-shaped) frame portion that surrounds the supporting stage **11**.

The recording processing unit **12** includes a tube holding portion **41**, a tank unit (refer to FIG. **1**) **42**, and a maintenance unit **43**. The tube holding portion **41** is disposed on the rear side (the first side) of the horizontal bridging frame **33** in the Y axis direction and holds ink tubes, cables and the like, the tank unit **42** is disposed on the front right and includes ink tanks of various colors, and the maintenance unit **43** is provided in order to maintain and recover the functions of recording heads **52**.

The recording unit **31** includes a carriage **51**, on which two of the recording heads **52** are mounted, and a pair of ultraviolet radiation units **54**, which are provided on both sides of the carriage **51** in the X axis direction. Each of the ultraviolet radiation units **54** includes an ultraviolet radiation LED from which ultraviolet rays are irradiated, which causes the ultraviolet curing ink that is discharged from the recording head **52** to cure (i.e., to be fixed).

The recording head **52** is an ink jet head that is driven to discharge by piezoelectric elements (piezo elements), and includes a plurality of nozzle rows (not shown) for each color that extend in the Y axis direction. In other words, the recording head **52** is configured to be capable of discharging plural colors of ultraviolet curing ink. Furthermore, the nozzle surface of the recording head **52** faces the recording medium A. Note that in this embodiment, a piezo system ink jet head is used. However, the invention it not limited thereto. For example, a thermal system or an electrostatic system ink jet head may also be used. The invention is also not limited to such on-demand types of ink jet heads, and a continuous type of ink jet head may also be used.

The X axis movement unit **32** is provided with a pair of upper and lower guide shafts **61**, and an X axis drive mechanism **62**. The guide shafts **61** are supported by the horizontal bridging frame **33** and support the recording unit **31** to reciprocally move freely along the X axis. The X axis drive mechanism **62** drives the recording unit **31** along the pair of guide shafts **61**.

The X axis drive mechanism **62** is provided with a timing belt **63**, a drive pulley **66** and a driven pulley **64**, a connecting fixing portion (not shown), and a carriage motor **65**. The timing belt **63** extends in the X axis direction along the pair of guide shafts **61**, and bridges the drive pulley **66** and the driven pulley **64**. The connecting fixing portion connects the timing belt **63** with the recording unit **31**. The carriage motor **65** drives the drive pulley **66**. In the X axis movement unit **32**, by causing the carriage motor **65** to rotate forward and backward, the recording unit **31** is caused to move reciprocally in the X axis direction on the pair of guide shafts **61** via the timing belt **63**. The recording process is performed by driving each of the recording heads **52** to discharge together with the reciprocal motion.

Next, description will be given of the side frames **34** with reference to FIGS. **5** to **7**. As shown in FIGS. **5** to **7**, on each of the side frames **34**, there is provided a raising and lowering movement unit **69** that causes the recording unit **31** to move in the vertical direction (the Z axis direction: a third direction), and causes the recording unit **31** to approach towards and separate from the supporting stage **11**. Specifically, each of the side frames **34** is provided with a box-shaped frame main body **68** that supports the horizontal bridging frame **33**, and a raising and lowering movement unit **69** that connects the frame main body **68** and the connecting frame **35** to one another. The raising and lowering movement unit **69** causes the frame main body **68** to move by being raised or lowered. By using the raising and lowering movement unit **69** to raise and lower the frame main body **68**, the recording unit **31** is moved by being raised and lowered via the frame main bodies **68**, the horizontal bridging frame **33**, and the X axis movement unit **32**. Accordingly, the recording unit **31** is caused to approach towards and separate from (i.e., adjust the gap with) the supporting stage **11** and the recording medium A that is supported by the supporting stage **11**.

The frame main bodies **68** support the horizontal bridging frame **33**. Furthermore, the frame main bodies **68** include fixing plate portions **68***a* (which fix the movable sides of each of the raising and lowering movement units **69**) on the center side (i.e., the supporting stage **11** side) of the recording apparatus **1**.

Each of the raising and lowering movement units **69** is provided with two raising and lowering guide mechanisms **71**, a raising and lowering drive mechanism **72**, and a raising and lowering drive motor **99**. The raising and lowering guide mechanisms **71** support the frame main body **68** to be raised and lowered freely in relation to the connecting frame **35**. The raising and lowering drive mechanism **72** is disposed between the two raising and lowering guide mechanisms **71** and causes the frame main body **68** to move in the vertical direction. The raising and lowering drive motor **99** drives the raising and lowering drive mechanism **72**.

The raising and lowering guide mechanism **71** is configured by the LM GUIDE mechanism, which is formed from a raising and lowering guide rail **74** that is fixed to the fixing plate portions **68***a*. The raising and lowering guide mechanism **71** is also a raising and lowering slider **75** that is fixed to the connecting frame **35**. Note that the symbols **79** and **80** are a first connecting member and a second connecting member, which connect the raising and lowering slider **75** and the connecting frame **35** to one another.

The raising and lowering drive mechanism **72** is provided with a ball screw mechanism that includes a raising and lowering nut member **76** that is fixed to the fixing plate portion **68***a*, and a raising and lowering threaded shaft **77** that is fixed to the connecting frame **35**. Note that in this embodiment, a configuration is adopted in which the raising and lowering nut member **76** is fixed, the raising and lowering threaded shaft **77** is caused to move rotationally, and the raising and lowering nut member **76** is caused to move in the vertical direction relative to the raising and lowering guide rail **74**. However, a configuration may also be adopted in which the raising and lowering threaded shaft **77** is fixed, the raising and lowering nut member **76** is caused to move rotationally, and the raising and lowering nut member **76** is caused to move in the vertical direction relative to the raising and lowering guide rail **74**.

As shown in FIGS. **4** to **6**, the connecting frame **35** is disposed on the rear surface side of the supporting stage **11**. The connecting frame **35** is disposed to overlap (in the X and Y directions) a movement region of the recording unit **31** and a placement region of the recording medium A. Specifically, the connecting frame **35** is provided with a plurality of rod-shaped frames **81**, a plate-shaped frame **82**, a plurality of vertical frames **85**, a plurality of horizontal frames **83**, and an attachment plate **84**. The rod-shaped frames **81** bridge the space between the base portion sides of both of the side frames **34**. The lower surface side of the plate-shaped frame **82** is fixed to a plurality of the rod-shaped frames **81**. The vertical frames **85** connect the plurality of rod-shaped frames **81** by both end portions thereof in the X axis direction. The horizontal frames **83** are fixed on the plurality of vertical frames **85** between the plurality of rod-shaped frames **81**, and extend parallel to the rod-shaped frames **81**. The attachment plate **84** bridges the plurality of rod-shaped frames **81**, and a drive motor **88** (described hereinafter) of the Y axis movement unit **13** is attached thereto.

The Y axis movement unit **13** is provided with a pair of linear guide mechanisms **86**, a Y axis movement mechanism (a lead screw mechanism) **87**, the drive motor **88**, and a pair of rail attachment bases **25***a* and **25***b*. The linear guide mechanisms **86** are positioned on both sides on the left and right of the rear surface side of the supporting stage **11**, and cause the recording processing unit **12** to slide in the Y axis direction in relation to the supporting stage **11**. The Y axis movement mechanism **87** is positioned on the center of the rear surface side of the supporting stage **11**, and causes the recording processing unit **12** to move in the Y axis direction in relation to the supporting stage **11**. The drive motor **88** drives the Y axis movement mechanism **87**. The rail attachment bases **25***a* and **25***b* are fixed to the rear surface side of the supporting stage **11**, and the guide rails **91** of each of the linear guide mechanisms **86** are attached thereto. The pair of linear guide mechanisms **86** are disposed to be separated from one another in the X axis direction, and the Y axis movement mechanism **87** is disposed between the pair of linear guide mechanisms **86** in the X axis direction. The drive mechanism referred to in an aspect of the invention is configured by the Y axis movement mechanism **87** and the drive motor **88**.

The linear guide mechanisms **86** are configured by the LM guide mechanism. The linear guide mechanisms **86** include the guide rails **91**, which are fixed to each of the rail attachment bases **25***a* and **25***b*, and extend in the Y axis direction, and sliders **92**, which are fixed to the plate-shaped frame **82** of the connecting frame **35** and freely slide on the guide rails **91**. The pair of guide rails **91** of the pair of linear guide mechanisms **86** include a guide rail **91***a* of the reference side (which is used as a reference during attachment), and a guide rail **91***b* of a corresponding following side. The guide rail **91***a* of the reference side is attached to the side at which the distributed load of the recording processing unit **12** is greater, that is, the right side (the left side in FIG. **4**) where the tank unit **42** is present. On the other hand, the guide rail **91***b* of the following side is attached to the left side (the right side in FIG. **4**).

The pair of rail attachment bases **25***a* and **25***b* includes the first rail attachment base **25***a* and the second rail attachment base **25***b*. The first rail attachment base **25***a* of the right side is fixed to the structural bar **21** of the right side (the left side in FIG. **4**), and the guide rail **91***a* of the reference side is attached thereto. Meanwhile, the second rail attachment base **25***b* of the left side is fixed to the structural bar **21** of the left side of the recording apparatus **1** (the right side in FIG. **4**), and the guide rail **91***b* of the following side is attached thereto. In this manner, the pair of rail attachment bases **25***a* and **25***b* are attached to be separated from one another in the X axis direction. The second rail attachment base **25***b* includes an attachment surface portion **93** that includes a rail attachment surface **93***a* onto which the guide rail **91***b* of the following side is attached.

On the other hand, the first rail attachment base **25***a* is provided with the attachment surface portion **93**, which includes the rail attachment surface **93***a* to which the guide rail **91***a* of the reference side is attached, and an attachment reference portion **94**. The attachment reference portion **94** continues in the X axis direction from the attachment surface portion **93**, and has a thickness that protrudes downward from the rail attachment surface **93***a*. The first rail attachment base **25***a* is configured such that, in the X axis direction, the attachment surface portion **93** is fixed to the outside of the supporting stage **11**, and the attachment reference portion **94** is fixed to the inside of the supporting stage **11**. Accordingly, the attachment surface portion **93** (the rail attachment surface **93***a*) of the first rail attachment base **25***a* is disposed at a position in the X axis direction that is separated further from the Y axis movement mechanism **87** than the attachment reference portion **94**. Since the first rail attachment base **25***a* is disposed on the right side (at which the distributed load of the recording processing unit **12** is greater), the load that the

first rail attachment base **25***a* receives from the recording processing unit **12** is greater than that received by the second rail attachment base **25***b*.

An attachment reference surface **94***a* (which is the side surface attachment reference of the guide rail **91***a* of the reference side) is formed on the side surface of the rail attachment surface **93***a* side of the attachment reference portion **94**. Furthermore, the attachment reference portion **94** reinforces the rigidity of the structural bar **21** due to the thickness and the width of the attachment reference portion **94**. In other words, the structural bar **21** of the right side (where the distributed load of the recording processing unit **12** is greater), is reinforced. Due to this reinforcement, the configuration is such that the amount of deflection, caused by the distributed load of the recording processing unit **12**, of the pair of structural bars **21** is the same. Accordingly, the amount of deflection, caused by the load from the recording processing unit **12**, of the supporting stage **11** is the same between the first rail attachment base **25***a* side and the second rail attachment base **25***b* side.

The Y axis movement mechanism **87** is mounted on the connecting frame **35**, and is configured by a ball screw mechanism. The Y axis movement mechanism **87** includes a threaded shaft **96**, which is fixed to the supporting stage **11** and extends in the Y axis direction, and a nut member **98**, which is fixed to the plate-shaped frame **82** of the connecting frame **35** via a supporting member **97** to rotate freely and screws onto the threaded shaft **96**. The (axis center of the) Y axis movement mechanism **87** is disposed between the surface (supporting surface: the portion that makes contact with the recording medium A) of the supporting stage **11** and the linear guide mechanisms **86** in the vertical direction (the direction in which the recording unit **31** and the supporting stage **11** oppose one another). The nut member **98** is caused to move in the Y axis direction relative to the threaded shaft **96** along a thread groove that is formed in the threaded shaft **96** by using the drive motor **88** to drive (e.g., rotate) the nut member **98**. In this manner, the recording processing unit **12** is caused to move in the Y axis direction along the linear guide mechanisms **86** using the Y axis movement unit **13**. In other words, the Y axis movement unit **13** causes the recording unit **31** to move in the Y axis direction via the frame portion (the horizontal bridging frame **33**, the side frame **34**, and the connecting frame **35**). Note that, in this embodiment, a configuration is adopted in which the threaded shaft **96** is fixed and the nut member **98** is driven to rotate. However, a configuration may also be adopted in which the nut member **98** is fixed and the threaded shaft **96** is driven to rotate. By extension, a configuration may also be adopted in which the nut member **98** is caused to move in the Y axis direction relative to the threaded shaft **96** by rotationally driving both the nut member **98** and the threaded shaft **96**.

In this embodiment, the rotating side and the fixed side of the raising and lowering drive mechanism **72** and the Y axis movement mechanism **87** are the reverse of one another with respect to the nut member (the raising and lowering nut member **76** and the nut member **98**) and the threaded shaft (the raising and lowering threaded shaft **77** and the threaded shaft **96**). However, these may also be the same. In other words, there is conceived to be a pattern in which the raising and the lowering threaded shaft **77** and the nut member **98** are the rotating side, and the raising and the lowering nut member **76** and the threaded shaft **96** are the fixed side (this embodiment). There is also conceived to be a pattern in which the raising and the lowering nut member **76** and the threaded shaft **96** are the rotating side, and the raising and lowering threaded shaft **77** and the nut member **98** are the fixed side. Furthermore, there may be a pattern in which the raising and lowering threaded shaft **77** and the threaded shaft **96** are the rotating side, and the raising and the lowering nut member **76** and the nut member **98** are the fixed side. Also, there may be a pattern in which the raising and lowering nut member **76** and the nut member **98** are the rotating side, and the raising and lowering threaded shaft **77** and the threaded shaft **96** are the fixed side.

In the recording operation of the recording apparatus **1**, the recording unit **31** is caused to be raised or lowered to a predetermined gap position in relation to the recording surface of the recording medium A by the raising and lowering movement units **69**. Subsequently, the recording processing unit **12** is caused to move intermittently from the second side to the first side in the Y axis direction by the Y axis movement unit **13** (line feed). During each pause in the intermittent movement of the recording processing unit **12** in the Y axis direction, the recording unit **31** is caused to move in the X axis direction using the X axis movement unit **32**, and the ink is caused to be discharged from the recording head **52** (recording process). Accordingly, a desired image is recorded on the recording medium A.

Note that, in this embodiment, when recording execution is commanded using the operation panel unit **24**, a test operation is executed before the recording operation. In other words, the user places the recording medium A on the supporting stage **11** in a state in which the recording processing unit **12** is disposed on the first side in the Y axis direction (the waiting position side when setting the recording medium A). Next, the user commands the recording execution using the operation panel unit **24** in a state in which the recording medium A is placed on (held by) the supporting stage **11**. When the printing execution is commanded, the recording apparatus **1** causes the recording processing unit **12** to move to the second side in the Y axis direction (the operation panel unit **24** side) using the Y axis movement unit **13**. At this time, while the recording unit **31** moves from the first side in the Y axis direction to the second side in the Y axis direction, contact between the recording processing unit **12** and an obstacle (regardless of whether the obstacle is one that the recording unit **31** is likely to make contact with) is detected using an obstacle detection sensor (not shown) that is provided in the recording processing unit **12**. Accordingly, the test operation is executed. The obstacle detection sensor detects whether there is a likelihood that the recording medium A and the recording unit **31** will come into contact with one another, and whether an obstacle that the recording unit **31** is likely to make contact with is present on the recording medium A or on the supporting stage **11**.

When an obstacle is detected in this test operation, the recording apparatus **1** causes the movement of the recording processing unit **12** to the second side in the Y axis direction to stop, and notifies the user of the error. On the other hand, when an obstacle is not detected while causing the recording processing unit **12** to move from the first side in the Y axis direction to the second side in the Y axis direction, the recording apparatus **1** determines that there are no obstacles, causes the recording processing unit **12** to move to a predetermined position on the second side in the Y axis direction (the recording start position side) and temporarily stops the movement. After temporarily stopping the movement, the recording apparatus **1** causes the recording processing unit **12** to move from the second side in the Y axis direction (the recording start position side) to the first side in the Y axis direction, and starts the recording operation.

According to the configuration described above, by disposing the linear guide mechanisms **86** on the rear surface side of the supporting stage **11**, the position of the recording process-

ing unit **12** is not heightened by the amount of the dimensions of the linear guide mechanisms **86**. In other words, it is possible to reduce the height dimension of the entire recording apparatus **1** (the dimension of the direction in which the recording unit **31** and the supporting stage **11** oppose one another). By causing the supporting stage **11** and the linear guide mechanism **86** to overlap one another by disposing the linear guide mechanisms **86** on the rear surface side of the supporting stage **11**, it is possible to reduce the planar dimensions (the dimensions of the directions that are perpendicular to the opposing direction described above) of the entire recording apparatus **1** in comparison with a configuration in which the linear guide mechanism **86** is disposed on the lateral side of the supporting stage **11**. Furthermore, the linear guide mechanisms **86** do not interfere with the recording performed by the recording unit **31** due to the linear guide mechanisms **86** being disposed on the rear surface side of the supporting stage **11**. Accordingly, it is possible to dispose the linear guide mechanism **86** to overlap with the movement region of the recording unit **31** and the placement region of the recording medium A in the X and Y directions. Thus, it is possible to reduce the planar dimensions of the entire recording apparatus **1** even in comparison to a configuration in which the linear guide mechanisms **86** are disposed on the upper surface side of the supporting stage **11**. In addition, it is possible to guarantee the parallelism of the table attachment surfaces onto which the table main body **26** is attached, and the parallelism of the rail attachment surfaces **93***a* onto which the guide rails **91** are attached by only milling the upper and lower surfaces thereof in relation to the structural bars **21** to which the rail attachment bases **25***a* and **25***b* are fixed. Accordingly, it is possible to manufacture the recording apparatus **1** easily in comparison to a configuration in which "the linear guide mechanisms **86** are disposed on the lateral sides of the supporting stage **11**", where it is necessary to mill the side surfaces.

By using a plurality of the linear guide mechanisms **86** that are separated from one another in the X axis direction, it is possible to stably perform the movement of the recording unit **31** in the X axis direction regardless of the position of the Y axis movement mechanism **87**.

By using two of the linear guide mechanisms **86**, which are disposed to interpose the Y axis movement mechanism **87**. It is also possible to stably perform the movement of the recording unit **31** in the Y axis direction.

In addition, the Y axis movement mechanism **87** is disposed between a portion (the surface) of the supporting stage **11** that makes contact with the recording medium A and the linear guide mechanism **86** in the direction in which the recording unit **31** and the supporting stage **11** oppose one another. Thus, it is possible to dispose the Y axis movement mechanism **87** as close as possible to the portion of the supporting stage **11** that makes contact with the recording medium A. Therefore, it is possible to suppress the influence of pitching centered on the Y axis movement mechanism **87**. The Y axis movement mechanism **87** does not interfere with the recording performed by the recording unit **31** due to the Y axis movement mechanism **87** being disposed between the portion of the supporting stage **11** that makes contact with the recording medium A and the linear guide mechanisms **86**. Accordingly, it is possible to dispose the Y axis movement mechanism **87** and the drive motor **88** to overlap with the movement region of the recording unit **31** and the placement region of the recording medium A in the X and Y directions.

It is possible to accurately perform the movement of the recording unit **31** relative to the supporting stage **11** due to the fixed side (the guide rail **91**) of the linear guide mechanism **86** being fixed to the supporting stage **11**, and the movable side (the slider **92**) of the linear guide mechanism **86** being fixed to the connecting frame **35**. Accordingly, it is possible to improve the movement accuracy of the recording unit **31**.

Due to mounting the Y axis movement mechanism **87** on the connecting frame **35**, the linear movement carried out by the Y axis movement mechanism **87** is not shifted in the X axis direction, and it is possible to more stably perform the movement of the recording unit **31** in the Y axis direction. The configuration described above does not impede the attachability or maintainability of the Y axis movement mechanism **87**.

Note that, in this embodiment, a configuration is adopted in which two of the linear guide mechanisms **86** are provided; however, a configuration may also be adopted in which only one of the linear guide mechanisms **86** is provided, and a configuration may also be adopted in which three or more of the linear guide mechanisms **86** are provided to be separated from one another in the X axis direction.

In this embodiment, a configuration was adopted in which one of the Y axis movement mechanisms **87** is provided; however, a configuration may also be adopted in which a plurality of the Y axis movement mechanisms **87** are provided to be separated from one another in the X axis direction.

Furthermore, in this embodiment, a configuration is adopted in which the linear guide mechanisms **86** and the Y axis movement mechanism **87** are disposed, together, on the rear surface side of the supporting stage **11**; however, a configuration may also be adopted in which only one of these is disposed on the rear surface side of the supporting stage **11**, and the other is disposed on the lateral side or the surface side of the supporting stage **11**.

In this embodiment, an LM guide mechanism (a linear ball guide mechanism) is used as the linear guide mechanism **86**; however, a sliding guide mechanism, or the like, for example, may also be used as the linear guide mechanism **86**.

In this embodiment, a ball screw mechanism is used as the Y axis movement mechanism **87**; however, the invention is not limited thereto. In other words, a sliding screw mechanism, a belt mechanism, or the like may also be used as the Y axis movement mechanism **87**.

In this embodiment, the invention is applied to the recording apparatus **1** in which recording is performed by moving the recording unit **31** in the X and Y directions; however, a configuration may also be adopted in which the invention is applied to the recording apparatus **1** in which recording is performed by moving the recording unit **31** that includes a line head in only the Y axis direction (a so-called line printer).

Note that, in this embodiment, the X axis direction is the so-called main scanning direction, and the Y axis direction is the so-called sub-scanning direction.

The entire disclosure of Japanese Patent Application No: 2013-065767, filed Mar. 27, 2013 is expressly incorporated by reference herein in its entirety.

What is claimed is:

1. A recording apparatus, comprising:

a stage, which includes a supporting surface that supports a recording medium;

a recording processing unit, which includes a recording unit that performs recording on the recording medium that is supported by the stage, and bridges a first direction so as to cross the stage; and

a movement unit, which causes the recording processing unit to move in relation to the stage in a second direction that is perpendicular to the first direction and is parallel to the supporting surface,

wherein the movement unit includes:

a drive mechanism, which causes the recording processing unit to move in the second direction in relation to the stage, and

a linear guide mechanism, which is disposed on a rear surface side of the stage, and supports the recording processing unit to be free sliding in the second direction in relation to the stage,

wherein the drive mechanism is disposed between a portion of the stage that makes contact with the recording medium, and the linear guide mechanism in a third direction, which is perpendicular to the first direction and the second direction.

2. The recording apparatus according to claim **1**,

wherein the movement unit includes a plurality of the linear guide mechanisms, which are separated from one another in the first direction.

3. The recording apparatus according to claim **2**,

wherein the drive mechanism is disposed between the plurality of linear guide mechanisms in the first direction.

4. The recording apparatus according to claim **1**,

wherein the recording processing unit includes

a recording unit,

a horizontal bridging frame, which crosses the stage and supports the recording unit,

a pair of side frames, which holds the horizontal bridging frame by a first side and a second side in the first direction, and

a connecting frame, which connects base portion sides of the pair of side frames to one another, and

wherein the linear guide mechanism includes

a guide rail, which is fixed to a rear surface side of the stage, and extends in the second direction, and

a slider, which is fixed on the connecting frame, and moves on the guide rail in a free sliding manner.

5. The recording apparatus according to claim **4**,

wherein the drive mechanism is mounted on the connecting frame.

6. The recording apparatus according to claim **1**,

wherein the drive mechanism is configured by

a drive motor, and

a lead screw mechanism, which is driven by the drive motor.

7. A recording apparatus, comprising:

a stage, which includes a supporting surface that is configured to support a recording medium;

a recording processing unit, which includes a recording unit that is configured to perform recording on the recording medium in at least some instances when the recording medium is supported by the stage, the recording processing unit bridges crossing the stage in a first direction; and

a movement unit, which causes the recording processing unit to move in relation to the stage in a second direction that is perpendicular to the first direction and is parallel to the supporting surface,

wherein the movement unit includes:

a drive mechanism, which causes the recording processing unit to move in the second direction in relation to the stage, and

a linear guide mechanism, which is disposed on a rear surface side of the stage, and supports the recording processing unit to be free sliding in the second direction in relation to the stage,

wherein the drive mechanism is disposed between a portion of the stage that makes contact with the recording medium, and the linear guide mechanism in a third direction, which is perpendicular to the first direction and the second direction.

8. A recording apparatus, comprising:

a stage, which includes a supporting surface that supports a recording medium;

a recording processing unit, which includes a recording unit that performs recording on the recording medium that is supported by the stage, and bridges a first direction so as to cross the stage; and

a movement unit, which causes the recording processing unit to move in relation to the stage in a second direction that is perpendicular to the first direction and is parallel to the supporting surface,

wherein the movement unit includes:

a drive mechanism, which causes the recording processing unit to move in the second direction in relation to the stage, and

a plurality of linear guide mechanisms, which are disposed on a rear surface side of the stage, support the recording processing unit to be free sliding in the second direction in relation to the stage, and are separated from one another in the first direction,

wherein the drive mechanism is disposed between the plurality of linear guide mechanisms in the first direction.

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